UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

GERTRUDE NEUMARK ROTHSCHILD, Plaintiff, v. CREE, INC., Defendant.	No. 10-CV-10133 WGY

CREE'S SUPPLEMENTAL MEMORANDUM IN SUPPORT OF ITS MOTION [NO. 2] FOR SUMMARY JUDGMENT OF PATENT INVALIDITY

Defendant Cree, Inc. ('Cree') respectfully submits this supplemental memorandum in support of its Motion [No. 2] For Summary Judgment Of Patent Invalidity.

Cree moved for summary judgment of patent invalidity on three grounds: (1) U.S. Patent No. 4,904,618 ('the '618 patent') is invalid as anticipated by a prior art reference, the Crowder article; (2) the '618 patent and U.S. Patent No. 5,252,499 ('the '499 patent') are invalid over the prior Philips work and for failure to name Dr. Fitzpatrick as a co-inventor; and (3) the '618 and '499 patents are invalid for lack of enablement. (Dkt. No. 103). The Court indicated in its March 9 and 15, 2010 Orders that it was considering granting summary judgment *sua sponte* against Cree on 'the specific issues of anticipation based on Crowder and invalidity based on lack of enablement.' (Dkt. Nos. 236, 239). As a matter of law, summary judgment *sua sponte* **against** Cree is not proper. The evidence already submitted standing alone establishes that no genuine dispute of material fact exists and summary judgment of patent invalidity **for** Cree is warranted.

Although Cree believes that the evidence already of record merits summary judgment of patent invalidity for Cree, in accord with the Court's invitation, Cree now supplements the record. Cree submits herewith the declaration of its invalidity expert, Dr. Eric Bretschneider, wherein Dr. Bretschneider adopts the patent invalidity opinions he offered in his Expert Report during expert discovery.[1] As described below, Dr. Bretschneider agrees with Cree that the '618 patent is anticipated by the Crowder article (*see* Sec. I below) and that the '618 and '499 patents are invalid for lack of an enabling disclosure (*see* Sec. II below). Furthermore, Cree's prior briefing set forth many bases supporting summary judgment of non-enablement. Additional,

[1] A copy of Dr. Bretschneider's Expert Report is attached as Exhibit 1 to his Declaration.

independent grounds not previously raised also support a finding that the patent disclosures are non-enabling. These additional, independent grounds are explained below in Section II.

Dr. Bretschneider has almost 20 years experience in the design, development, and manufacture of optoelectronic devices, including light emitting diodes ('LEDs'), and products made of optoelectronic components. He also has extensive experience in the growth and characterization of compound wide band gap (WBG) semiconductors (including growth of II-V and III-V compound semiconductors), doping of compound semiconductors (including the evaluation of novel precursors for p-type doping of ZnSe), and epitaxial growth techniques (including the design, manufacture and operation of custom MOCVD systems). A further summary of Dr. Bretschneider's experience is set forth in his Expert Report. *See* Bretschneider Expert Report, ¶¶ 6-7, Appx. A (curriculum vitae).

I. THE '618 PATENT IS INVALID AS ANTICIPATED BY THE CROWDER ARTICLE

Anticipation under 35 U.S.C. § 102 requires that a single prior art reference disclose each and every limitation of the claimed invention. *Liebel-Flarsheim Co. v. Medrad, Inc.*, 481 F.3d 1371, 1381 (Fed. Cir. 2007). Whether a patent is invalid as anticipated is a question of fact. *Id.* at 1377.

There are no genuine disputes of material fact about the disclosure in the Crowder article[2] and that the Crowder article is anticipatory prior art that discloses every limitation of Claims 1 and 4 of the '618 patent. In support of its Motion, Cree identified in Appendix C the

[2] B.L. Crowder *et al.*, 'EPR Luminescence Studies of Er+3 in Acceptor-Doped ZnTe,' Physical Review, Vol. 181, No. 2, May 1969 at pp. 567-573.

correspondence between the Crowder article and each element of the asserted claims of the '618 patent.[3]

Cree's invalidity expert, Dr. Bretschneider, agrees with Cree that the Crowder article discloses every element of the asserted claims of the '618 patent and is anticipatory prior art that invalidates the '618 patent. *See* Bretschneider Decl., ¶ 6; Bretschneider Expert Report, ¶ 72, Appx. E. The manifest correspondence between the asserted claim methods and the methods disclosed in the Crowder article is summarized in Dr. Bretschneider's Expert Report:

> As discussed further below, in the late 1960's, researchers at IBM, including B. Crowder and G. Pettit, fabricated working LEDs from the wide band-gap semiconductor ZnTe. The LEDs emitted visible light (including green and red). The ZnTe semiconductors were made using a co-doping process where 2 compensating co-dopants were intentionally introduced into the crystal together during growth. The co-dopants employed were combinations of either Erbium (Er) and lithium (Li) or Er and phosphorus (P). The Crowder group specifically reported on using substantially equal amounts of the two co-dopants during the ZnTe crystal growth process. The group also provided experimental data showing improvement in the solubility of the Er in the ZnTe crystal (by a factor of 10 to 100) compared to doping the ZnTe crystal with Er alone. Lastly, the co-doped ZnTe crystals were subjected to 'thermal treatments which are known to remove Li' from the ZnTe.

Bretschneider Expert Report, ¶ 38.

Appendix E to Dr. Bretschneider's Expert Report provides a detailed, 7-page summary of Dr. Bretschneider's opinions regarding the Crowder article and identifies with specificity the disclosure in the Crowder article that corresponds to each element of the asserted claims. Dr. Bretschneider does not stand alone in these opinions: Plaintiff's expert, Dr. Shealy, agreed at deposition that the Crowder article discloses each and every limitation of the '618 patent. *See* Appendix C to Cree's Motion [No. 2].

[3] For the Court's convenience, a copy of Appendix C previously submitted with Cree's Motion [No. 2] is attached hereto.

Based on the evidence Cree submitted with its Motion, as well as Dr. Bretschneider's opinions, there is no legitimate dispute of material fact that precludes summary judgment in Cree's favor that the '618 patent is invalid as anticipated by the Crowder article. Moreover, there are no undisputed material facts that merit summary judgment against Cree. Indeed, in Opposition to Cree's Motion, Plaintiff contended that disputed facts exist that preclude judgment for Cree. Thus, even according to Plaintiff, summary judgment *sua sponte* against Cree that the Crowder reference is not anticipatory prior art is unwarranted.

II. THE '618 AND '499 PATENTS ARE INVALID FOR LACK OF ENABLEMENT

Whether a claim 'satisfies the enablement requirement of 35 U.S.C. §112, ¶1 is a question of law based on underlying facts.' *AK Steel Corp. v. Sollac & Ugine*, 344 F.3d 1234, 1238 (Fed. Cir. 2003). The factual components of an enablement analysis include (1) the breadth of the claims, (2) the presence or absence of working examples, (3) the amount of direction or guidance presented, and (4) the quantity of experimentation necessary. *See e.g.*, *id. at* 1245; *In re Wands*, 858 F.2d 731, 737 (Fed. Cir. 1988).

Cree moved for summary judgment that the ‘618 and ‘499 patents are invalid as a matter of law for failure to satisfy the statutory enablement requirement, 35 U.S.C § 112, ¶ 1, because: (1) the full scope of the claims are not enabled; (2) the paper examples of the patents do not work; and (3) undue experimentation is required to practice the claimed methods. Dr. Bretschneider agrees with Cree and has opined, for the reasons set forth in his Expert Report, that the specifications of the ‘618 and '499 patents do not teach those of ordinary skill in the art at the time the applications were filed how to make and use the invention as broadly as it is claimed, without undue experimentation and, therefore, the asserted patents are invalid for lack of an enabling disclosure. *E.g.*, Bretschneider Expert Report, ¶¶ 69, 91-158 (non-enablement of the '618 patent), 266-311 (non-enablement of the '499 patent); *see* Bretschneider Decl., ¶¶ 7, 8.

The '618 and '499 patents are also not enabled for additional, independent grounds that are summarized as follows:

A. The '618 Patent Disclosure Does Not Enable One of Skill in The Art to Determine The Equilibrium Concentration of Dopants

The asserted claims of the ‘618 patent recite methods for obtaining a 'non-equilibrium concentration' of a less mobile dopant into a WBG semiconductor. The specification explains that 'non-equilibrium impurity incorporation' means 'the incorporation of a dopant (impurity) in excess of its **equilibrium solubility** at a particular temperature and concentration of compensating species.' (‘618 patent at 1:66-2:1 (emph. added)). Thus, the disclosure must enable one of ordinary skill in the art to determine without undue experimentation the 'equilibrium solubility' of a desired dopant in all WBG semiconductors. *See* Bretschneider Expert Report, ¶ 149. Without knowing what that solubility threshold is, one cannot know whether a non-equilibrium concentration of a dopant has been (or could be) introduced into the semiconductor by performing the claimed methods. *Id*. at ¶¶ 149, 156.

Although the methods require one of skill at the time to know dopant equilibrium solubility as a baseline, Plaintiff admitted shortly after the patent application was filed that 'intrinsic equilibrium solubilities are not known for wide-gap materials.' (Exh. 33 (G.F. Neumark, 'Achievement of Well Conducting Wide-Band-Gap Semiconductors: Role of Solubility and Nonequilibrium Impurity Incorporation,' Phys. Rev. Lett. Vol. 62, No. 15, pp. 1800-1803 at p. 1801 (1989))).[4] Furthermore, the specification does not disclose what the equilibrium solubility is for any dopant in any semiconductor. The specification also does not teach how one of skill in the art could ascertain or calculate the equilibrium solubility for a dopant in a WBG

[4] Exhibit 33 is attached to the Declaration of David Radulescu in Support of Cree’s Supplemental Memorandum In Support Of Its Motion [No. 2] For Summary Judgment Of Patent Invalidity, submitted concurrently herewith.

semiconductor. Although it is plain from the specification itself that these critical teachings are missing, Dr. Bretschneider confirms that one of ordinary skill in the art would not find this important information in the patent disclosure. Bretschneider Expert Report, ¶¶ 149, 152.

Furthermore, based on Plaintiff's infringement allegations against Cree's methods of making GaN-based semiconductors, the disclosure must enable one of skill in the art to practice the claims to make GaN and AlGaN having a 'non-equilibrium concentration' of a dopant (for example, magnesium in the accused Cree processes). However, Plaintiff admitted at deposition that '[y]ou won't be able to' determine the equilibrium solubility of magnesium in GaN made by Cree's MOCVD processes:

> Question: So how do you determine how much magnesium is soluble in gallium nitride at the growth temperature without the presence of hydrogen in accordance with your '618 patent?
>
> Answer: You won't be able to do that with MOCVD.

(Exh. 9 (Rothschild Depo. (Feb. 5, 2007)) to the Radulescu Decl. (Dkt. No. 187) at 159:11-16). Dr. Rothschild also admitted that she did not know 'how much magnesium you [would] need to put in[to] [GaN-based semiconductors] in order to determine if you're falling within the scope of the '618 patent.' (*Id.* at 164:8-19.) Nor could anyone else – there is **no** disclosure in the patent pertaining to 'equilibrium' and 'non-equilibrium' concentrations of any dopant in any III-V semiconductors, including GaN. *See* Bretschneider Expert Report, ¶¶ 153-154. Thus, the '618 patent disclosure does not enable one of skill in the art to determine the equilibrium concentration of dopants in WBG semiconductors without undue experimentation. *See id.* at ¶¶ 156-158.

B. The '499 Patent Disclosure Does Not Enable One of Skill in the Art to Introduce and Remove 'Effective Amount(s)' Of Material

The asserted claims of the ‘499 patent recite methods for obtaining a 'low resistivity semiconductor' by introducing and subsequently removing specific amounts ('effective amount[s]') of dopant and atomic hydrogen. First, a 'substrate' is simultaneously doped with 'an effective amount of dopant to induce acceptable conductivity' and 'an effective amount of atomic hydrogen to act as a compensator and block unacceptably high occurrences of other compensators.' ('618 patent, Claim 10). Subsequently, 'an effective amount of the added hydrogen to reduce the resistivity of the semiconductor' is removed from the semiconductor. *Id*. The Court has construed 'effective amount' to mean 'a quantity sufficient to produce the recited result.' (May 3, 2007 Order [Dkt. No. 34] at 14).

For each of the reasons set forth in Dr. Bretschneider's Expert Report, the '499 patent disclosure does not enable one of skill in the art to introduce and remove 'effective amount(s)' of material without undue experimentation. *See* Bretschneider Expert Report, ¶¶ 297-309. Among the grounds, the specification does not define an 'effective amount' and lacks objective guidance about how to determine or calculate what an 'effective amount' is 'to provide the recited result' in the claim. For example, to ascertain the 'effective amount' of atomic hydrogen to compensate the dopant and block other compensators, one would have to know, at a minimum, how many undesirable compensating impurities are present in the crystal. Yet there is no teaching in the specification about, and one of skill in the art would not know, how to quantitate the amount of undesirable compensating impurities in a crystal. Indeed, if too little atomic hydrogen is added the crystal, the recited result in the claim cannot be achieved. Moreover, brute force experimentation to make a semiconductor according to the claimed methods would not have been a prudent or cost effective approach because of the sheer number of materials and process

conditions that would need to be tested and the accompanying expensive costs and time required. *Id*. at ¶ 307.

* * *

For each of these reasons, and the grounds set forth in Cree's previous briefing, summary judgment *sua sponte* against Cree that the '618 and '499 patents are not invalid based on lack of enablement is not justified.

III. CONCLUSION

For all of the reasons stated in Cree's Motion and herein, Cree respectfully requests that the Court grant Cree's Motion [No. 2] that the '618 and '499 patents are invalid and not grant summary judgment *sua sponte* against Cree that the '618 patent is not anticipated by the Crowder article and that the '618 and '499 patents are not invalid based on lack of enablement.

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By: */s/ David C. Radulescu*

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CERTIFICATE OF SERVICE

I hereby certify that on March 19, 2010 a true copy of the foregoing document CREE'S SUPPLEMENTAL MEMORANDUM IN SUPPORT OF ITS MOTION [NO. 2] FOR SUMMARY JUDGMENT OF PATENT INVALIDITY was served upon the attorney of record for each other party by the Court's ECF system pursuant to Local Rule 5.2(b).

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